

Embodied Design Ideation Methods: analysing the power of estrangement

Danielle Wilde

SDU Design, University of
Southern Denmark, Kolding
d@daniellewilde.com

Anna Vallgård

IxD lab, The IT University of
Copenhagen, Denmark
akav@itu.dk

Oscar Tomico

Eindhoven Univ. of Technology
ELISAVA, Barcelona, Spain
otomico@elisava.net

ABSTRACT.

Embodied design ideation practices work with relationships between body, material and context to enliven design and research potential. Methods are often idiosyncratic and – due to their physical nature – not easily transferred. This presents challenges for designers wishing to develop and share techniques or contribute to research. We present a framework that enables designers to understand, describe and contextualise their embodied design ideation practices in ways that can be understood by peers, as well as those new to embodied ideation. Our framework – developed over two conference workshops – provides a frame for discussion of embodied design actions that leverage the power of estrangement. We apply our framework to eight embodied design ideation methods. Our contribution is thus twofold: (1) a framework to understand and leverage the power of estrangement in embodied design ideation, and (2) an inspirational catalogue demonstrating the diversity of ideas that embodied design ideation methods can foster.

Author Keywords

Embodiment; ideation; design research; design methods; disruption; estrangement.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

INTRODUCTION

With the computer's outward reach [22] now manifested in tangibles, wearables, virtual, augmented and mixed realities, and increasingly also through Internet of Things, the role of the body has become key in design ideation. This shift has resulted in an increase of methods designed to ensure the perspective of the mobile body (c.f. [45, 39, 48]).

The challenge of such methods is to address the mundane and the intimate, to inspire new forms of interactions and new forms of design. In this paper we study best practice within *embodied design ideation* (EDI) and develop a framework to analyse, build on and share its methods.

Methods within EDI can vary greatly. They are often idiosyncratic, developed by a specific designer-researcher over years of practice, the underlying expertise and emergent knowledge tacit, rather than explicit. These characteristics make it difficult to bring EDI practices into an articulate space, such that they may be replicated, changed or easily transferred. Our framework addresses this challenge directly. It has been developed to assist designers and design researchers to navigate the myriad of existing EDI possibilities, to help them better understand the inherent values of their own and others' practices, to help them articulate how and why they perform the tasks they do, and finally to aid the development of new methods. Articulating the underlying questions, contexts and actors that shape EDI methods, and sharing their implementation without a direct embodied exchange, is key to a better standing within the design research community. Doing so can ensure the necessary critical and reflective engagement with existing practice and theory moving forward.

Our framework has been developed over two workshops held in conjunction with two HCI conferences (Aarhus Decennial 2015 and TEI 2016 [69, 63]). At the workshops embodied design researchers guided all participants through their methods (c.f. Figure 1) then engaged in a broad



Figure 1. Participants in the first workshop enacting the “Material Props in Context” EID method for the first time.

discussion of EDI methods. The framework was developed by the authors in-between, during and after the two workshops, with a beta-version forming the basis of exercises and discussion at the second.

In this paper we lay out the complex terrain of Embodied Design (ED). Our overview of existing work underlines the rich diversity in this burgeoning field. We detail our method of studying best practice, leading to the framework. We provide an inspirational catalogue of eight EDI methods all analysed using the framework. Finally, we reflect on the outcome of this study and look at how the framework might be used to develop new EDI methods.

EMBODIED DESIGN

ED enables all of a person's senses to be leveraged in an emergent design space. It draws first and foremost on phenomenology [24, 25, 50] and related theoretical frameworks such as pragmatist aesthetics [15, 57], embodied cognition [68] and embodied, embedded and enacted minds [9, 10, 19, 20, 21, 35]. ED encompasses ideation, speculation, engagement and analysis, as well as the more commonly discussed, embodied interaction [17]. Our concern in this paper is held to ED Ideation (EDI).

In EDI, performative traditions are used to extend the above theoretical understandings into ideation practices. In 1991, and again in 2013, Brenda Laurel provided a compelling argument that theatre could be a rich and empowering resource for designing engaging interactions with computers [40]. The influence of theatre and drama (c.f. [5, 7, 32, 71] dance [36, 70] and other somatic traditions such as Feldenkrais and yoga [29, 30] continue to gain currency.

With these influences, EDI typically relies on *estrangement* to enliven the ideation process and bring new ways of designing into being. As we demonstrate in the inspirational catalogue below, by drawing on design researchers' and participant's first-person experiences throughout the design process, EDI affords enriched opportunities for knowledge generation and experience creation.

Phenomenology

Phenomenology is a method of philosophical inquiry that favours reflective attentiveness to "lived experience." In the preface to his 1946 opus [50], Merleau-Ponty notes the diversity of methods, approaches, ontological registers, and changing definitions for phenomenology and declares it is a "style of thinking" rather than a doctrine or method. It is a "re-learning to look at the world" an attempt to "bring back all the living relationships of experience."

Phenomenological approaches to EDI are fostering a slew of methods where performance and bodily engagement *in context* are key. Leaning heavily on her background in dance, Kozel [37], for example, developed a method for literally performing phenomenologies, placing the human body at the centre of explorations of interactive interfaces, responsive systems, and affective computing.

Philosopher and former dancer, Maxine Sheets-Johnstone [55] argues for the primacy of movement as the fundamental form of perception. She asserts that movement is at the core of life. We were born moving. Yet articulating deeply felt physically engaged experiences can be challenging: "What is experientially felt in both an affective and kinaesthetic sense clearly poses a challenge to language not only because such experiences are dynamic, but because language is not experience in the first place." [54] Sheets-Johnstone here provides insight into why EDI methods tend to be idiosyncratic and tacit, challenging to communicate such that they may be adopted and adapted – in action – and thus contribute to an evolving and coherent ED research field.

Estrangement

To "re-learn" [50] how to look at the world most, if not all, EDI researchers bring the body into situations that turn the familiar upside-down as means to enable reflection on the intimate and the tacit [4, 36, 70]. These are strategies of estrangement. Estrangement has been used as a basic strategy in artistic expression, ethnography and design, throughout the twentieth century [4, 13]. It is epitomised in the surrealist slogan "making the ordinary extra ordinary" [41], and can be understood as what Russian Formalist Art critic, Viktor Shklovsky, describes as the "artistic-poetic power of defamiliarization" [56]. The concept of estrangement is centred on the idea that the act of experiencing something occurs in the moment of perception and that the further you confuse or otherwise prolong the moment of arriving at an understanding, the deeper or more detailed that understanding will be. Harding [23] argues that making strange, thus, is the beginning of any scientific enquiry as something made strange demands attention and brings forth questions. Further, Sheets-Johnstone's theories about making strange bring focus to and through the moving body to leverage the knowledge that can be generated through embodied ideation [55].

The Landscape of EDI Methods

EDI methods play out in many different ways in research and practice (c.f. [39, 42, 48, 64]). The reasoning behind how and why different methods work is often difficult to grasp, especially when the format of sharing is text-based, such as through conference or journal articles. Embodied sharing (e.g. through workshops) is not feasible as the primary outlet for any kind of research, even if it may be best suited. Being able to articulate the underlying questions, contexts and actors that shape EDI methods, and share their implementation without direct embodied exchange, is thus key to a better standing within the design research community.

Addressing this challenge could ensure critical and reflective engagement with emerging, as well as existing practice and theory, by experts as well as novices. It could thus support consolidation and coherent growth of ED research, moving forward. The lack of a single shared

language or set of understandings in EDI makes addressing this challenge difficult. There have been workshops that have sought to address this issue [2, 49], without achieving notable impact beyond the workshop participants. Comparison tables of EDI methods have also been provided to situate new work in context [43, 44]. But the comparisons underline the diversity, rather than identify a commonality that might support design action. Conducting a coherent analysis of EDI across published work is difficult. Different methods have different foci and outsets even if they all swirl around and with the body. Höök and colleagues, for instance, use Feldenkrais, Mindfulness and Somaesthetics to develop theories and practices around core mechanics and experiential artefacts (c.f. [29, 31, 61]). Ross and Wensveen [51] use lived aesthetic experience as a core mechanism for EDI. Ylirisku and Buur [73] use video to capture emerging research outcomes in the wild, and conduct embodied reconstructions.

Many researchers draw directly from performance methods: Iacucci and Kuuti [32] use situated scenarios to envision new ideas; Brandt and Grunnet [5], use 'magic tools' as props for thinking in action; Kirsh [34] explores physical thinking, using the body as an instrument of cognition; Wilde, Schiphorst and Klooster [71] use the body and movement as material; Schiphorst et al. [12, 14, 52], and Loke et al. [43], use performance-based methods and technique to bring focus to the knowing body.

Other researchers focus on developing movement skills: championing the need for the designer as movement expert, and foregrounding the expressive power of gesture [27, 28]; stressing the importance of skilled action, and bringing focus to the experience of use [16]. Yet others focus on designing representations of movement, evaluating the user experience, mapping interactions, or exploring sensing technologies. EDI approaches include: kinaesthetic interaction [18], embodied sketching [47], *bodystorming* (physically situated brainstorming) and *informance* (informative performance) [6, 7], and embodied storming – an extension of bodystorming that supports collaborative embodied cognition [53]. Others include: co-designing with users [11], sensitizing designers [26], and otherwise bringing focus to aesthetic experience and interaction using different methods, guiding principles and supporting techniques. The list of EDI approaches is extensive, and the context of applications vast.

This diversity combined with the challenge of effectively transferring embodied methods calls for ways of grouping and understanding the work. Idiosyncratic methods and approaches continue to add to the canon of existing repertoire. But this is not enough to build a coherent community of practice. Calls for a shared set of understandings, better connections between theory and practice and, the need for the formation of a coherent community are increasing [2, 30, 49, 58, 72].

The aim of the work presented in this paper is thus to give designers (a) a way of navigating the myriad of EDI possibilities, (b) a way of understanding and developing their own work within their self-reflexive context, as well as within the broader context of embodied design theory and practice, and (c) a way of articulating their work for others. Deepening understanding of a designer's own and others' work through the common lens of a single overarching framework affords the development of a common language, and a common set of understandings. This, in turn, supports the formation of a more coherent community that can be reinforced over time by a constant interweaving of rhizome-like ties between each new, idiosyncratic approach, and the existing canon.

To develop an overarching framework for EDI we analysed a number of EDI methods. The result is a set of questions that can be used to effectively discriminate between different methods, share them, adopt and adapt them to other contexts and actors.

METHOD

To access a practice that is normally dispersed and diverse, we undertook two one-day open call workshops. The first in conjunction with Aarhus decennial Critical Alternatives Conference, 2015 [69], the second at the Tangible Embedded Embodied Interaction Conference, 2016 [63]. The workshop calls were distributed broadly (c.f. [3]). The stated intentions were: to engage authors of EDI methods, and colleagues and peers who use these methods, in an experimental enquiry around what constituted different approaches to EDI; to simultaneously contribute to understanding of how to effectively share EDI methods, and the evolution of those methods; and thus lay the foundation for an ongoing conversation in an expanded community of theorists and practitioners [69]. At the outset of each workshop, our intention to publish our findings in a high profile HCI conference such as CHI was made explicit. Participants were given the option to participate in the published study or decline their consent, without penalty. All workshop participants consented.

Corpus of IDE methods

The workshop calls asked for a description of a practiced EDI method submitted either in, text, video and/or pictures [63, 69]. All submissions were accepted. Across the two workshops 17 participating design researchers introduced and facilitated 14 methods that they developed or use regularly (c.f. Figure 1). The workshop participants enacted these methods and engaged in discussion around what each method does, how they actually work in practice, and what the commonalities and differences might be. This approach allowed us to experience a range of methods first hand and collectively bring them into language. During the workshops we realised that six of the methods focused more on embodied interaction than ideation, and/or iterated elements present in other methods. We thus ended up with

Table 1 Overview of the # of methods in the two workshops

Total # of	participants	methods	methods used for analysis
Workshop 1 (Aarhus)	11	8	6
Workshop 2 (TEI)	6*	6*	2*

*Excludes the three authors and their methods, which were presented in both workshops, but are only included in the tally for the first.

eight distinct EDI methods (see Table 1) that we describe later in the inspirational catalogue.

Process of the workshops

Each workshop began with participants presenting the core principles of their methods then guiding the others through an enactment. Participants had brought props, where necessary, to facilitate this process. After each method we had a short discussion session where we were able to clarify uncertainties regarding both practice and principles. We then experimented with combining the methods in various ways. The pairing was solely based on interest from the method owners. The purpose was to discover how useful such a process might be to develop new methods. The success of this exercise varied but the exercise itself lent us an extra opportunity to become familiar with each other's idiosyncratic approaches to EDI. In the first workshop, we conducted a joint discussion around EDI methods. Throughout, we documented enactments with photographs and videos, and took notes during the discussions.

Following the first workshop we (the authors) met up in a one-day session to go through each of the EDI methods and describe to each other how and why they worked. We did this by moving back and forth between our embodied experiences and memories from the workshop and the documentary material. We conducted our analysis by comparing how the different EDI methods were applied and what they each yielded. Our aim was to identify similarities and differences. This approach assisted us in identifying the drivers and requirements for each method. Based on our findings we were able to flesh out the higher-level dynamics that seemed to work across the methods. We thus were able to develop a first iteration of our framework:

What are you adding to the body? (what is being *disrupted*)

What does this disruption make you aware of? (what is being *destabilised*?)

What can this process be used for? (what *emerges*?)

This 'beta-version' was the basis for the second workshop where the participants used it to explain and analyse their own and each other's method. All participants expressed how this framework assisted them to better understand and articulate what their methods did. It was considered of value not only in communicating methods, but in analysing,

refining and developing new methods. The framework was thus considered an important contribution to practice.

This exercise also pointed to aspects of the framework that needed clarification for it to communicate clearly. Some alterations were made in situ. Afterwards, the authors of this paper spent another day testing the robustness of the modified questions. We continued iterating until the questions worked equally well explaining the dynamics of every method. The three authors each own one of the methods, thus we could verify first-hand whether the analysis worked across the three that we knew intimately. Additionally, we consulted the owners of the other methods, and they approved the description and analysis of their methods as presented in this paper.

DISRUPT – DESTABILISE – EMERGE – EMBODY

In this section we present our analysis of the different EDI methods. We address their shared tactics and analyse how and why they work. We then present the framework to untangle and describe each EDI method.

The estrangements in EDI methods take on many forms and provoke many different kinds of thinking – we see this both in previous work and in our eight example methods. We thus found it useful to further unpack the concept as means to describe how it functions as a component of the methods, and to discriminate between them and their outcome type.

As it plays out in the workshop methods, estrangement entails some sort of act to disrupt the familiar. Significantly, what it destabilises may not be in the same medium as what it disrupts. For example, a disruption might set constraints on how a person moves around in space, but what it destabilises might be their perception, rather than their tactile experience of that space. What emerges in this example pertains to new ideas or concepts of how to engage with that space. Thus, we formulated this concept through the following questions:

What is done to *disrupt* the usual way of doing [something] or the current state of affairs?

What physical or conceptual elements are added to or taken away from the body or the action?

What is *destabilised* by this disruption?

What norms, traditions, structures, or systems become – conceptually or physically – unstable?

What *emerges* from this destabilisation?

What does it bring into awareness? How is the previous landscape altered?

What does this entire process *embody*?

What idea, quality, or feeling does the process give tangible or visible form to?

To further clarify how these questions are to be understood we looked to formal (OED) definitions of the key words:

- To *disrupt* is to prevent a process or an event from continuing as usual or as expected. A disruption acts in a temporal context.
- To *destabilise* is to render a system or a structure unstable. A destabilisation acts in a structural or systemic context.
- To *emerge* is for something to come out of something or from behind something.
- To *embody* is to express, or give a tangible or visible form to (an idea, quality, or feeling)

Indeed, a disruption is an event in time that temporarily or permanently destabilizes (something) and from this destabilization something new emerges. When you throw a stone into the water it is a disruption that destabilizes the surface and from this a pattern of ripples emerges. The disruption can be physical (e.g. the throwing of a stone) or conceptual (e.g. a new procedure); what it destabilizes can equally be physical (e.g. the water) or conceptual (e.g. perception of a practice); and finally what emerges can be ideas for new physical designs (e.g. vibrating clothing) or for designs grounded in new values or desires (e.g. embodied communication).

The final question of what this estrangement process embodies is posed to give a sense of the domain in which the method operates, and thus provide a hint as to what the outcome will be. Identifying the domain will help clarify the genre of theories and related work needed to analyse the outcome of the method. Thus, it aids in the articulation of a research contribution.

In the next section we show how unpacking the practice of estrangement thus facilitates navigation among existing EDI methods, by helping a researcher determine whether a method might be fit for their purpose. This unpacking aids in articulating why and how a method works, which is particularly important when writing up design research. It also may prove useful prescriptively, to develop new methods for new design challenges. We return to this final point in the discussion.

EIGHT METHODS FOR EMBODIED IDEATION

In this section we describe each of the eight EDI methods, using the authors own words as well as our experiences from the workshops. We then unpack them further using our framework. Each method is described using this same two-step manner for easy reference and navigation. As addressed in the previous section the first two questions of the framework are used to unpack the act of estrangement and the last question serves to place the method within a genre of theory and related work. The third question – the question of what emerges from the act of estrangement – is useful as means to understand what the methods can be used for and thus also as a means to organize a description



Figure 2. Material Props in Context': Exploring new experiences with a piece of sound insulating material.

of the methods. We imagine most designers will be interested in what kind of outcome they can expect from using a method and that this may also be the discriminating factor of which to choose. Thus we have chosen to present the methods after what kind of knowledge emerges from their estrangement. This led us to the following groupings: *New Material Forms*; *New Concepts*; and *New (Bodily) Behaviours*. These groups make explicit and show a variety of uses for EDI methods, and thereby provide a frame to assist our analysis and discussion. They are by no means exhaustive or definitive. Had our collection of methods been different at the outset, this categorisation may also have differed.

1. New Material Forms

The first group covers three methods working with a specific material or technology to open the design space around that.

Material Props in Context

Developed by Oscar Tomico at the Eindhoven University of Technology (TU/e), this method entails draping your body in a material of interest, then moving around in a specific context to concurrently explore the space and the material (c.f. Figure 2). The interplay between material, body, and context thus becomes the foundation for ideation. As Tomico states: “[i]deating on the body in context allows a designer to combine language with movement in abstract ways, and to think through and with the full range of their movement capabilities and perceptions. This approach (...) allows the designer to become personally experienced in the context with which their design is concerned, and to relate functionality through both material and use, by means of their body. [It] allows meaning to emerge directly from interaction with the material (...) [It] also allows designers to design *for* the senses *from* the senses, opening the door for multisensory interactive qualities and complex interrelations.” [64]



Figure 3. ‘Topology of the Fabric’: draping laser cut fabric directly on the (moveable) body

When applying our EDI framework questions to “Material Props in Context” we note the *disruption* is caused by how the chosen material is experimentally added to the body in context, without regards for the material’s previous purpose (c.f. Figure 2). Pulling a material out of its usual context *destabilises* our understanding of that material’s potential; including how it can be used in relation to the body, (and) in a chosen context. What *emerges* from this action is a re-contextualisation of material properties and experiences and thus new perspectives on the material’s potential in contextualised use. The “Material Props in Context” method thereby *embodies* material potential.

Topology of the fabric

Developed by Pauline van Dongen, at Eindhoven University of Technology (TU/e), this method entails altering a textile material’s behavioural properties through the use of generative design and digital fabrication. As part of the design process, the altered fabric is draped on a live model. The designer can thus study the material’s behaviour in motion on a person who can move and respond at will. The new behavioural possibilities of the fabric enhance the fabric’s ability to conform to, complement, or even provoke the body.

In Figure 3, for example, programmed laser-cut geometries enable a stiff non-woven fabric to open up, expand, and contract in new ways. The previously fixed surface can now shift its topology – dynamically, across three-dimensions. In this new body/material relationship, the body can inflict changes to the garment topology just as the changing garment topology can invite different bodily movements. These new possibilities allow for a more interactive and dynamic use of textiles, and can inspire the integration of rigid, inflexible materials in garments in ways that are both wearable and comfortable. As such it opens up new ways to design for wearable technologies.

When we apply the EDI framework questions to the “Topology of the Fabric” it becomes clear that by mechanically altering the characteristics of a fabric –



Figure 4. ‘Props for Embodying Temporal Form’: experiments with vibration. L: an off-the-self intimate vibrator R: a custom made system to compose vibrating rhythms.

through laser cutting or other means – the topological potential of the material is *disrupted*. This *destabilises* the act of draping, as the material behaves in unexpected ways. What emerges are ideas for new kinds of fabric garments, and new ways to move in and with garments. Essentially, this method *embodies* the dynamic and expressive potential of altering fabrics in relation to the body by means of digital fabrication and code.

Props for Embodying Temporal Form

Developed by Anna Vallgård in the IxD lab at the IT University of Copenhagen, this method entails exploring known actuators (e.g. heat, vibration, EMS, shape-changes, etc.) in relation to the body by reframing them as props. Initially, off-the-shelf products (vibrators, EMS etc.) can be used, then as the design process progresses custom systems are developed that afford more control over expression. To begin, actuating props are positioned experimentally on different places on the body to provoke imagined or staged contexts. This process enables a concurrent investigation of what technology on different bodily locations might signify, and how different *temporal forms* can be experienced (c.f. Figure 4). Temporal form refers to compositional state changes of an actuator over time (e.g. patterns of vibrations). It is a key element of what sets computational things apart from most other design materials [67]. This method is informed by the bricolage experimental engineering approach to interaction design [66].

Applying the EDI framework questions to “Props for Embodying Temporal Form” highlights how the props *disrupt* the body through applying dynamic output in varied temporal patterns. These temporal sensations *destabilise* habitual interpretations of sensory stimuli as well as perceptions of what can be done with existing technologies. What *emerges* are new uses of existing technological features and new forms of interactions. This method *embodies* technologically produced temporal forms.



Figure 6. 'Object Theater – Stakeholder drama': bus stop scene in action.

2. New Concepts

This group comprises ideation methods for new concepts for design. The resulting concepts are not grounded in a specific material or technology but rather in new aesthetics or social relations.

Embodying Past Expressions

Developed by Sarah Kettley, Sarah Walker and Katherine Townsend at Nottingham Trent University, and presented at the workshop by Sarah Walker, this method explores historic garments as inspiration for contemporary wearable technologies. In this method focus is given to historic garments that have “particular shaping and tailored fits, (...) specific purposes such as uniforms or (...) removable parts for laundering and body adornment e.g collars and cuffs (including lace).” [33] As the authors of this method explain: “The fragile nature of the archived garments, and the processes by which they can be extracted from storage, mean that historical garments may be hard to work with in an embodied way; they cannot be handled, manipulated and recombined.” To get around this problem, the authors worked with blown-up copies of photographs of the garments and garment elements, which they drape on the body or use as a foundation for experimental placement of technology components (c.f. Figure 5). Within this process, they have begun to develop a visual language of “degraded photocopies, greys, transparencies and textural layers” and to “transfer [their] imagined embodied experience with the garments into this visual language.” [33]

When we apply the EDI framework questions we find the *disruption* in this method is the use of disposable photocopies to represent otherwise fragile inaccessible historical garments and ornamental details. Bringing historical elements into play, in this way, with current technologies *destabilises* our understanding of how technology might be applied to the body. It allows us to conflate ways that people have worn garments and ornamental elements in the past with current technological potential. What *emerges* from this destabilisation are new

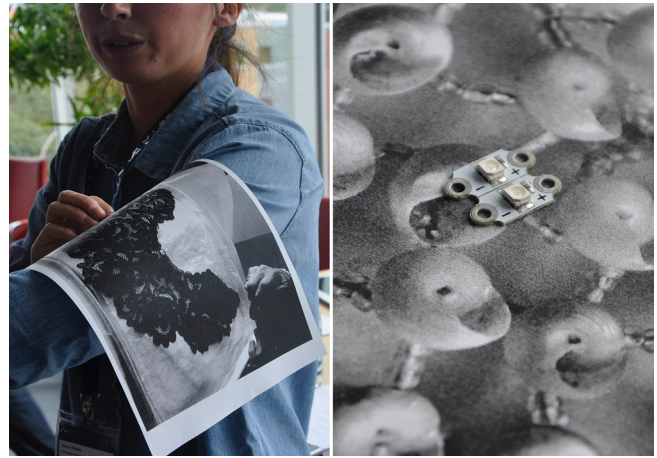


Figure 5. 'Embodying Past Expressions': a photocopy of a vintage embroidered embellishment is explored on the body.

visions for how technologies might be incorporated into garments. This method thus *embodies* past ornamental applications for new technological paradigms.

Object Theater – Stakeholder drama

Jacob Buur and Preben Friis at the University of Southern Denmark develop the second method in this group 'Object Theater' [8]. The method is multifaceted so in the workshop we focused on the aspect of 'Products in social settings – stakeholder drama'. Object Theater, in general, is a genre in which actors use everyday objects in storytelling to create a performance [8]. When used in design this method asks actors (designers) to take the perspective of the 'other' (users, objects, and other stakeholders), and thus experience alternate relations between these stakeholders [8].

To enact this method we played out a bus stop scene that comprised two travellers, a ticket, a bus stop and bus stop sign, a bus, a ticket vendor, a driver etc., by becoming the different elements – people and objects – in the scene (c.f. Figure 6). Each human and non-human perspective was played by a different person, who was focused on defending that perspective. This method thus provides detailed insight into what prejudices and expectations might look like to others in a design scenario. [8] As the authors explain: “We may think we can contain many perspectives in our heads and weigh them up against each other. But most of us (...) are too biased to give all perspectives equal importance. For some (...) it is easy to see the advantages, for others the disadvantages” [8]. This method flattens hierarchies and thus enables new visions for collaborative interactions.

When we apply the EDI framework questions to the “Object Theatre – Stakeholder Drama” method, we can see that the *disruption* entails using the designer in place of both human and non-human elements. Playing out a scenario thus *destabilises* social relations between all – human and non-human – actors. What *emerges* are new understandings of context, politics, and relations, and thereby new concepts for design. This method *embodies* the



Figure 7. ‘OWL Bodyprops’: embodied exploration of a prop while being interviewed about the desires it inspires.

dynamic potential of social relations between human and non-human actors.

OWL bodyProps

Developed by Danielle Wilde and Kristina Andersen at STEIM Amsterdam and The University of Tokyo, Japan, this method “engages participants in co-creation and collaborative imagining of [technologies that do] not yet exist.” [70] The method uses carefully constructed – technology-free – wearable probes to bring the wearer’s attention to their body in inhabitable ways (c.f. Figure 7). The bodyProp probes are thus used in embodied interview sessions as a catalyst for magical thinking [70]. Interviewees are dressed in the probes and asked simple questions such as: “How does it feel? What is it? What does it do? And if it contained some kind of technology that hasn’t been imagined before, that gave you magical powers, what kind of powers would they be?”

As Wilde and Andersen explain, “asking someone to imagine yet-to-be-imagined technologies puts a strain on that person’s ability to bring ideas into being. *What do you really want, if you could have anything?* is an awful question to ask, and when you do ask it, you will mostly get simple, modest answers.” [70] The bodyProps “create an emergent, imaginative space” within which the designers can: “plumb people’s willingness to imagine through the body (...); let others’ embodied experience and imagination assist in the creation of unknown technologies; and bring wearers’ attention to their embodied(ness), to see if this brings them present to their inner state and encourages magical thinking.” [70]

This method *disrupts* the body by strapping an unfamiliar object to it. With the addition of the simplistic operational questions, this combination *destabilises* where the attention is and thus what can be imagined using everyday reasoning. What *emerges* are radical imaginings grounded in desire, which can lead to new concepts for embodied technology design. This method thus *embodies* latent desires.



Figure 8. ‘Props for Undesigning’: re-situating everyday actions by means of L: a tube of cloth, and R: a ribbon.

3. New (Bodily) Behavior

This third group comprises two methods in which the emergence of new bodily behaviour is used as a source for derivative design.

Props for Undesigning (Interrelations series)

Developed by Johan Stjernholm *et al.* [59] at Keimyung University, Daegu, the Props for Undesigning method aims “to highlight embodied thinking as a method of re-situating problems, questions, and answers, as part of a creative process.” [59] The method uses props to reframe everyday concepts and principles of action. For example, in the workshop a silk ribbon was used to define how a person moves through a space, and a white fabric tube was used to at once restrict and inspire movements and thus challenge understanding of what forms clothing might take (c.f. Figure 8). The method cycles through three stages with the objects, from “a normal world, where things and objects have their ordinary values, into a phenomenological realm of durational, embodied experiences. Then the normal world is re-entered, but appearing in a transformed state.” As Stjernholm explains: “This workflow is strongly linked to the anthropologist Victor Turner’s ideas of the liminal and liminoid.” [65, 60] As the designers cycle through, they formulate embodied questions and solutions together, based on how they are perceiving the gradual unfolding and transformation of the shared problem.

When we apply the EDI framework to this method we see that the props are used to *disrupt* everyday rules of engagement. This *destabilises* beliefs around how one “should” behave. What *emerges* are new movement behaviours, new ideas. The method thus *embodies* movement potential.

Collaborative somatic inquiries

Developed by Sarah Fdili Alaoui *et al.* [1] at the LRI-Université Paris-Sud, the Collaborative Somatic Inquiries method explores “how technology affect our relationship with our physical selves: our weight, breath, flow...etc.”



Figure 9. ‘Collaborative Somatic Inquiries’: emerging bodily expressions undertaken in pairs.

and how we might “design for enriching our sensorial world and capacities” [1] (c.f. Figure 9).

As Fdili Alaoui explains, the method involves “embodied exploration for movement generation, observation and articulation,” [1] the goal of which is to articulate sensorial experiences, and ways they might play out in the design realm. For example, a Collaborative Somatic Inquiry begins with a guided body awareness exercise where a workshop leader mentions all the parts of the body one by one while participants stand with their eyes closed. Participants are then paired and asked to move in relation to each other’s bodies (c.f. Figure 9). After some moments participants are asked to be aware of how they move so they might repeat their movements. The entire exercise is conducted in silence.

By unpacking the method using the EDI framework questions we see the *disruption* entails focused expressive and repetitive movement explorations, the enacting of which *destabilise* our understandings of the capacities and constraints of the body in motion. What *emerges* from this process is an awareness of new movement patterns and habits. This method thus *embodies* body consciousness.

In this section we have presented the methods grouped by what kind of knowledge emerges (and what kind of outcome this emergence embodies). We thus make explicit a variety of uses for EDI methods. Following, we analyse the methods’ dynamics: how they disrupt and what they destabilize. Doing so enhances understanding of the individual methods, and provides a set of strategies that can be used when developing new EDI methods. It thus further demonstrates the utility of the EDI framework.

ANALYSIS OF METHODS’ DYNAMICS

The eight methods presented here seek to destabilise how designers think about the matters at hand – the norms, experiences, and preconceived notions they bring to the act of designing. If “every object made by man is the embodiment of what is at once thinkable and possible” [46] then we can see how these methods all seek – first and

foremost – to expand what is thinkable. This approach differs from engineering methods that focus on expanding what is doable. It is not that thinking and doing are ever possible to completely separate. Indeed, foregrounding an expansion of what is thinkable typically leads to an expansion of what is doable and vice versa. By means of their disruption dynamics these methods make visible new opportunities in what might otherwise remain everyday, embodied engagements. We posit that such dynamics are necessary when designing for the body, as few things are as ingrained or habitual as how people engage with the world as embodied beings.

If we look to the methods’ disruption dynamics we can identify four different strategies to achieve the estrangement that enables the destabilisation: 1. Re-contextualization; 2. Change of bodily sensations through artefacts; 3. Enactments; and 4. Alterations in the material at hand. These four strategies are by no means exhaustive, but signify a beginning in the endeavour to analyse, compare, and communicate EDI methods at a higher level of abstraction without losing depth.

1. Re-contextualization

Two of the methods make use of re-contextualization as a disruption strategy to destabilize preconceived notions of the matter at hand. In *Material Props in Context*, placing a material in a new and possibly unusual context *destabilises* our understanding of that material’s potential. In *Embodying Past Expressions* disposable photocopies of otherwise fragile inaccessible historical garments afford enriched explorations of contemporary wearable technologies.

2. Changing bodily sensations through artefacts

Three of the methods seek to destabilize bodily sensation by adding new stimulations or restrictions on participant bodies through the use of various artefacts. In *Props for Embodying Temporal Form*, technologies are used to apply temporal stimulation (vibrations, EMS etc.) on different places on the body, to provoke new sensations and thus new imagined use of the technology. *OWL bodyProps* uses wearable probes to bring the wearer’s attention to their body in inhabital ways. *Props for Undesigning* uses everyday materials like a silk ribbon or a white fabric tube to restrict and inspire bodily movements, to *disrupt* everyday rules of engagement and thus challenge understanding of what forms different designs might take.

3. Enactments

Two methods rely on embodied enactment to destabilize previous understandings of situations. For example, enacting focused, expressive, and repetitive movement explorations in the *Collaborative Somatic Inquiries* method *destabilises* understandings of the capacities and constraints of the body in motion. In a very different approach, the enactments in *Object Theater – Stakeholder drama*, enable participants to see the scenario and its social/political

relations from the varied perspectives of human and non-human elements with parity.

4. Altering the material

Finally, by altering the material (or the technology) the Topology of the Fabric method explore new ways of using the material or technology for design.

DISCUSSION

As addressed in the beginning of this paper felt experiences are idiosyncratic and to a large extent exist beyond language. To bring what is tacitly understood into an articulate space in ways that are coherent with felt experience requires an almost unimaginable act of translation. This almost unimaginable act is the main roadblock to effectively transferring, adopting and adapting EDI practices – their embodied nature is their great gift, yet this same gift frustrates attempts to express them in the form of the spoken or written word. EDI practices thus embody the challenge they present to traditional modes of scientific reporting: to make sense of them, one needs to experience them first-hand, or risk losing extraordinary richness and depth.

The challenge for effective reporting of EDI research is therefore to keep the process of abstraction subjective. Abstraction by generalizing and summarizing can lead to an oversimplification. For example, immersing yourself in the water on a windy beach to explore the effect of sound and vibration on the body is much more than simply “experiencing nature”. The relation between the temperature of the water, the strength of the sea currents, the shoes that you are wearing, the position of the body and an unimaginable amount of other meaningful issues for the individual engaged in this felt experience will be discarded.

To articulate the felt experience of an embodied design ideation process requires bringing felt experience into language. Answering what is done to *disrupt*, what is *destabilised*, what *emerges*, and what the whole *embodies*, is an iterative way to achieve this almost unimaginable act without discarding so much of a method’s inherent richness and depth. In attempting to answer the EDI framework questions, our workshop participants (in the second workshop) engaged each other in the sense making process, steering a dynamic, collaborative dialogue. This approach afforded the reflexive engagement with process that is necessary for refinement. It enriched the understanding of each practice and enabled participants to effectively and critically share nuanced and repeatable methods.

In the two previous sections we demonstrate the explanatory and analytical power of the EDI framework. Significantly, the full variety of approaches could be described by applying our framework: it helps make explicit what emerges from using each method, and the dynamics at play. For numerous workshop participants, this outcome was a revelation in terms of empowering them to better understand, articulate and communicate their

research contribution. Furthermore, the framework brings to light weaknesses in concept, method, or motivation where they exist. It became clear, for example, that when the medium of what is *destabilised* is the same as what is initially *disrupted*, it becomes difficult for the method to move beyond this medium, to open up possibilities that might surprise or delight in their potential applications.

Moving theory forward

We believe the EDI framework can also powerfully support the development of new methods, for instance, for emerging contexts of application. The framework could be used prescriptively, for example, as guidelines to generate new EDI methods grounded in existing practice. Indeed, EDI practices in the making can benefit from: finding a key aspect to disrupt, identifying a situation or process to destabilise, understanding what emerges from this destabilisation, and developing a sense of direction and overall picture of what has been embodied. To substantiate this belief we plan to conduct a series of workshops in which the EDI framework is leveraged in different ways to test its potential as a tool for developing new EDI methods.

We will also further explore ways that EDI methods might be combined. At the two workshops we conducted, we tentatively mashed-up two or more methods. In some cases it seemed to work and in others it came to a full creative stop. Analysing the result of the mash-ups using our framework led to some interesting insights – regarding how to combine methods, and also about the inner workings of the methods. For instance, when combining ‘Props for Embodying Temporal Form’ and ‘OWL bodyProps’ during the first workshop what seemed innocent/intriguing in adding vibrations to the OWL bodyProps resulted in an imaginary standstill. As we saw in the previous section, both methods make use of strategy 2. *Changing bodily sensations through artefacts* for disruption. The goal of the OWL bodyProp is to destabilize the attention and thus what might be imagined; the addition of vibrations became too sensorially explicit. This specificity seemed to overshadow the imagination and compete in a demand for the attention. The fixed form of the vibrations in the shape of the OWL bodyProp likewise closed down the imagination of where and how the vibrations could be used on the body. In both cases the disruption was no longer open-ended but a more fully designed artefact and thus the destabilisation did not seem to yield the emergence of new desires or ideas.

We believe that continuing with this line of inquiry would lend us more detailed insight into why and how different EDI methods work. The outcome of which could both serve as explanatory and argumentative regarding specific methods, as well as in devising new ones.

ACKNOWLEDGMENTS

We thank the participants of our workshops for their generous contributions, the organisers of the conferences that hosted our workshops, and the ACs and reviewers who have helped make this paper what it is today.

REFERENCES:

1. Sarah Fdili Alaoui. 2015. Collaborative Somatic Inquiries. *Workshop submission for Embodying Embodied Design Research at Århus 2015 Critical Alternatives*.
2. Alissa N. Antle, Paul Marshall, Elise van den Hoven. 2011. Workshop on embodied interaction: theory and practice in HCI. In *CHI '11 Extended Abstracts on Human Factors in Computing Systems* (CHI EA '11). ACM, New York, NY, USA, 5-8.
3. ArcInTex Architecture Interaction and Textiles Network conference workshop advertisement: <http://arcintex.hb.se/news/59/17/TEI-Workshop-Embodying-Soft-Wearables-Research/>
4. Genevieve Bell, Mark Blythe and Phoebe Sengers. 2005. Making by making strange: Defamiliarization and the design of domestic technologies. *ACM Transactions on Computer-Human Interaction* (TOCHI) 12, 2 (2005), 149-173.
5. Eva Brandt and Camilla Grunnet. Evoking the future: Drama and props in user centered design. *Proceedings Participatory Design Conference* (PDC 2000). 2000.
6. Marion Buchenau and Jane Fulton Suri. Experience Prototyping. In *Proc. Designing Interactive Systems* (DIS2000), ACM Press (2000) 424-433.
7. Colin Burns, Eric Dishman, William Verplank, and Bud Lassiter. 1994. Actors, hairdos & videotape—informance design. In *Conference Companion on Human Factors in Computing Systems* (CHI '94), ACM, New York, (1994), 119-120. DOI=<http://dx.doi.org/10.1145/259963.260102>
8. Jacob Buur and Preben Friis. 2015. Object Theatre in Design Education. | Designing with Theatre Objects. In *the Proceedings of Nordes No 6* (2015): Nordes 2015: Design Ecologies, ISSN 1604-9705
9. Andy Clark. 1998. *Being There: Putting Brain, Body and World Together Again* MIT Press.
10. Andy Clark. 2010 *Supersizing the Mind Embodiment, Action, and Cognitive Extension* (Philosophy of Mind). Oxford University Press.
11. CoDesign; International Journal of CoCreation in Design and the Arts. Taylor and Francis <http://www.tandfonline.com/loi/ncdn20>
12. Greg Corness and Thecla Schiphorst, Performing with a system's intention: embodied cues in performer-system interaction. In *Proc. Creativity and Cognition* (C&C 2013) ACM, NY (2013), 156-164.
13. Arthur Coleman Danto. 1981. *The transfiguration of the commonplace: a philosophy of art*. Harvard University Press.
14. Shannon Cuykendall, Ethan Soutar-Rau, Karen Cochrane, Jacob Freiberg, and Thecla Schiphorst. 2015. Simply Spinning: Extending Current Design Frameworks for Kinesthetic Empathy. In *Proceedings of the Ninth International Conference on Tangible, Embedded, and Embodied Interaction* (TEI '15). ACM, New York, NY, USA, 305-312.
15. John Dewey. 2005 (1934). *Art as Experience*. New York, N.Y.: Perigee (Penguin, Berkley)
16. Tom Djajadiningrat, Ben Matthews, and Marcelle Stienstra. 2007. Easy doesn't do it: skill and expression in tangible aesthetics. *Personal Ubiquitous Comput.* 11, 8 (December 2007), 657-676.
17. Paul Dourish. 2004. *Where the action is: the foundations of embodied interaction*. MIT press, 2004.
18. Maiken Hillerup Fogtmann, Jonas Fritsch, and Karen Johanne Kortbek. 2008. Kinesthetic interaction: revealing the bodily potential in interaction design. In *Proceedings of the 20th Australasian Conference on Computer-Human Interaction: Designing for Habitus and Habitat* (OZCHI '08). ACM, New York, NY, USA, 89-96.
19. Shaun Gallagher. 2012. *Phenomenology*. Palgrave Macmillan.
20. Shaun Gallagher. 2016. *How the body shapes the mind*. Oxford University Press, (2006)
21. Shaun Gallagher and Dan Zahavi. 2012. *The phenomenological mind*. Routledge; 2 edition
22. Jonathan Grudin. 1990. The computer reaches out: The historical continuity of interface design. In *the Proceedings of the Conference on Human Factors in Computing Systems* (CHI '90), pp. 261-268.
23. Sandra Harding. 1991 *Whose Science? Whose Knowledge?* Ithaca, NY: Cornell University Press
24. Martin Heidegger. 1996 *Being and time*. Trans. Joan Stambaugh. Albany: *State University of New York Press*.
25. Martin Heidegger. 1977. *The Question Concerning Technology*. trans., W. Lovitt. NY: Harper and Row.
26. John Hughes, Val King, Tom Rodden, and Hans Andersen. 1995. The role of ethnography in interactive systems design. *interactions* 2, 2 (April 1995), 56-65. DOI=<http://dx.doi.org/10.1145/205350.205358>
27. Caroline Hummels and Jelle van Dijk. 2015. Seven Principles to Design for Embodied Sensemaking. In *Proceedings of the Ninth International Conference on Tangible, Embedded, and Embodied Interaction* (TEI '15). ACM, NY (2015), 21-28.
28. Caroline Hummels, Kees C. Overbeeke, and Sietske Klooster. 2007. Move to get moved: a search for methods, tools and knowledge to design for expressive and rich movement-based interaction. *Personal Ubiquitous Comput.* 11, 8 (December 2007), 677-690.

29. Kristina Höök, Anna Ståhl, Martin Jonsson, Johanna Mercurio, Anna Karlsson, and Eva-Carin Banka Johnson. 2015. COVER STORY: Somaesthetic design. *interactions* 22, 4 (June 2015), 26-33
30. Kristina Höök, Martin Jonsson, Anna Ståhl, Jakob Tholander, Toni Robertson, Patrizia Marti, Dag Svanaes, Marianne Graves Petersen, Jodi Forlizzi, Thecla Schiphorst, Katherine Isbister, Caroline Hummels, Sietske Klooster, Lian Loke, and George Poonkhin Khut. 2016. Move to be Moved. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (CHI EA '16). ACM, New York, NY, USA, 3301-3308.
31. Kristina Höök, Martin P. Jonsson, Anna Ståhl, and Johanna Mercurio. 2016. Somaesthetic Appreciation Design. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (CHI '16). ACM, New York, NY, USA, 3131-3142.
32. Giulio Iacucci and Kari Kuutti. 2002. Everyday Life as a Stage in Creating and Performing Scenarios for Wireless Devices. *Personal Ubiquitous Comput.* 6, 4 (January 2002), 299-306.
DOI=<http://dx.doi.org/10.1007/s007790200031>
33. Sarah Kettley, Sarah Walker, & Katherine Townsend. 2015. Evidencing Embodied Participatory Design. In *the Proceedings of the Workshop contribution for Embodied Ideation Workshop at the Aarhus Decennial: Critical Alternatives*
34. David Kirsh. 2010. Thinking with the Body. *Proc. Cognitive Science Society* (2010), 2864-2869
35. Julian Kiverstein and Andy Clark. Introduction: Mind embodied, embedded, enacted: One church or many? *Topoi* 28.1 (2009): 1-7.
36. Lone Koefoed Hansen and Susan Kozel. 2007. Embodied imagination: a hybrid method of designing for intimacy. *Digital Creativity.* 18, 4. 207-220.
37. Susan Kozel. 2007. *Closer: Performance, Technologies, Phenomenology*. Cambridge: MIT Press.
38. Susan Kozel. The virtual and the physical. In M. Biggs and H. Karlsson (Eds.) *The Routledge Companion in Research in the Arts*, 2010.
39. Astrid Tweneboa Larssen, Toni Robertson, Lian Loke, Jenny Edwards (eds.) *Personal & Ubiquitous Computing Special issue on movement-based interaction* 11(8), Springer, 2007
40. Brenda Laurel *Computers as Theatre*. Addison Wesley; First Edition edition. May 1991; Addison-Wesley Professional; 2nd edition. Sept. 2013
41. Henri Lefebvre. "Towards a Leftist Cultural Politics: Remarks Occasioned by the Centenary of Marx's Death, 1988." In *Marxism and the Interpretation of Culture*, edited by C. Nelson and L. Grossberg, 75-88. Urbana and Chicago: University of Chicago Press, 1991.
42. Lian Loke and Toni Robertson. 2011. The lived body in design: mapping the terrain. In *Proceedings of the 23rd Australian Computer-Human Interaction Conference* (OzCHI '11). ACM, New York, NY, USA, 181-184.
43. Lian Loke and Toni Robertson. 2013. Moving and making strange: An embodied approach to movement-based interaction design. *ACM Transactions on Computer-Human Interaction (TOCHI)*. 20, 1. 7.
44. Leilah Lyons, Brian Slattery, Priscilla Jimenez, Brenda Lopez, and Tom Moher. 2012. Don't forget about the sweat: effortful embodied interaction in support of learning. In *Proceedings of the Sixth International Conference on Tangible, Embedded and Embodied Interaction* (TEI '12), Stephen N. Spencer (Ed.). ACM, New York, NY, USA, 77-84.
45. Catriona Macaulay, Giulio Iacucci, Shaleph O'Neill and Tomi Kankainen (eds.) Special issue on The Emerging Roles of Performance within HCI and Interaction Design. *Interacting with Computers* 18, 5, 869-1164 (September 2006).
46. Ezio Manzini. 1989. *The Material of Invention: Materials and Design*. MIT Press. Cambridge, USA
47. Elena Márquez Segura, Laia Turmo Vidal, Asreen Rostami, and Annika Waern. 2016. Embodied Sketching. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (CHI '16). ACM, New York, NY, USA, 6014-6027.
48. Paul Marshall, Alissa Antle, Elise Van Den Hoven, and Yvonne Rogers (eds.). Special Issue on the Theory and Practice of Embodied Interaction in HCI and Interaction Design *ACM Transactions on Computer-Human Interaction*, Vol. 20, No. 1 (2013)
49. Helena M. Mentis, Kristina Höök, Florian Mueller, Katherine Isbister, George Poonkhin Khut, and Toni Robertson. 2014. Designing for the experiential body. In *CHI '14 Extended Abstracts on Human Factors in Computing Systems* (CHI EA '14). ACM, New York, NY, USA, 1069-1074.
50. Maurice Merleau-Ponty. 1996. *Phenomenology of perception*. trans. Colin Smith. Motilal Banarsidas
51. Philip R. Ross and Stephan A. G. Wensveen. 2010. Designing Behavior in Interaction: Using Aesthetic Experience as a Mechanism for Design. *International Journal of Design.* 4, 2. 3-13.
52. Thecla Schiphorst, Kristina Andersen. Between bodies. *Proc. CHI 2004 Fringe Papers*. ACM Press, 2004
53. Dennis Schleicher, Peter Jones, and Oksana Kachur. 2010. Bodystorming as embodied designing. *Interactions* 17, 6 (November 2010), 47-51.
DOI=<http://dx.doi.org/10.1145/1865245.1865256>

54. Maxine Sheets-Johnstone. 2010. Why is movement therapeutic? *American Journal of Dance Therapy*. 32, 1, 2-15.
55. Maxine Sheets-Johnstone. 2011. *The primacy of movement*. John Benjamins Publishing.
56. Viktor Shklovsky. 1965 (1917). *Art as Technique*. In *Russian Formalist Criticism: Four Essays*. Translated by L. Lemon and M. Reis. Lincoln: University of Nebraska Press.
57. Richard Shusterman. 2000. *Pragmatist Aesthetics: Living Beauty, Rethinking Art*. Second Edition. Lanham, Maryland: Rowman and Littlefield
58. Aneesha Singh, Ana Tajadura-Jimez, Nadia Bianchi-Berthouze, Nic Marquardt, Monica Tentori, Roberto Bresin, and Dana Kulic. 2016. Mind the Gap: A SIG on Bridging the Gap in Research on Body Sensing, Body Perception and Multisensory Feedback. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '16)*. ACM, New York, NY, USA, 1092-1095.
59. Johan Stjernholm, Katja Vaghi, Emma-Ruth Richards, & Flora Zeta. 2015. Interrelations. *Workshop submission for Embodying Embodied Design Research at Århus 2015 Critical Alternatives*.
60. Johan Stjernholm, Moving through the virtual: A dramaturgy of choreographic practice and perception. *Dance Dramaturgy: Catalyst, Perspective and Memory*. *Proc. Society of Dance History Scholars Conference, SDSH*. 2011.
61. Petra Sundström, Elsa Vaara, Jordi Solsona, Niklas Wirström, Marcus Lundén, Jarmo Laaksohata, Annika Waern, and Kristina Höök. 2011. Experiential artifacts as a design method for somaesthetic service development. In *Proceedings of the 2011 ACM symposium on The role of design in UbiComp research & practice (RDURP '11)*. ACM, New York, NY, USA, 33-36.
62. Doug Svanæs, 2013. Interaction Design for and with the Lived Body: Some Implications of Merleau-Ponty's Phenomenology. *ACM Trans. Comput-Hum. Interact.* 20, 1, Article 8 (March 2013)
63. Oscar Tomico and Danielle Wilde. Embodying Soft Wearables Research. In *Proc. Tangible, Embedded, and Embodied Interaction*. ACM (2016): 774-777.
64. Oscar Tomico and Danielle Wilde. 2016. Soft, embodied, situated & connected: enriching interactions with soft wearables. *mUX: The Journal of Mobile User Experience* (2016) 5:3
65. Victor Turner. Variations on a Theme of Liminality. In Sally Falk Moore, Barbara G. Myerhoff (eds.) *Secular Ritual*. Assen [u.a.] : Van Gorcum, 1977. p.36-52.
66. Anna Vallgård and Ylva Fernaeus. 2015. Interaction Design As a Bricolage Practice. In *the Proceedings of the Ninth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '15)*, pp. 173-180.
67. Anna Vallgård, Morten Winther, Nina Mørch, & Edit Emese Vizer. 2015. Temporal Form in Interaction Design. *International Journal of Design*. 9, 3. 1-15.
68. Francisco J. Varela, Evan Thompson and Eleanor Rosch. *The Embodied Mind: Cognitive Science and Human Experience*. MIT Press (1993)
69. Danielle Wilde, Oscar Tomico, Andrés Lucero, Kristina Höök, Jacob Buur. Embodying Embodied Design Research Techniques. 5th Decennial Aarhus Conference on Critical Alternatives. Aarhus University and ACM. 2015 DOI: <http://dx.doi.org/10.7146/aahec.v1i1.21620>; see also: <https://embodieddesignresearch.wordpress.com>
70. Danielle Wilde. 2015. Embodying Material Ideation. In *the Proceedings of the Participatory Innovation Conference*, pp. 386-397.
71. Danielle Wilde, Thecla Schiphorst, & Sietske Klooster. 2011. Move to design • design to move: a conversation about designing for the body. *Interactions*. 18, 4. 22-27.
72. Anna Xambó, Carey Jewitt, and Sara Price. 2014. Towards an integrated methodological framework for understanding embodiment in HCI. In *CHI '14 Extended Abstracts on Human Factors in Computing Systems (CHI EA '14)*. ACM, New York, NY, USA, 1411-1416.
73. Salu P. Ylirisku and Jacob Buur. 2007. *Designing with Video*. Springer Verlag.